

## Establishing pneumoperitoneum: Verres or Hasson? The debate continues

N Dunne<sup>1</sup>, MI Booth<sup>2</sup>, TCB Dehn<sup>2</sup>

Departments of <sup>1</sup>General Surgery and <sup>2</sup>UGI/Laparoscopic Surgery, Royal Berkshire Hospital, Reading, UK

### ABSTRACT

**INTRODUCTION** The technique of establishing pneumoperitoneum for laparoscopic surgery remains contentious, with various different techniques available and each having its own advocates. The Verres needle approach has attracted much criticism and is seen to entail more risk, but is this view justified in the era of evidence-based medicine?

**PATIENTS AND METHODS** Over a 6-year period, a prospective study was undertaken of 3126 patients who underwent laparoscopic surgery performed by two upper gastrointestinal surgeons. One surgeon preferred the Verres needle and the other an open technique. A database was created of all cases and complication rates of the different techniques ascertained.

**RESULTS** Peri-umbilical Verres needle was used in 1887 cases (60.4%) with two complications encountered, both of which were colonic injuries, with an incidence of 0.1%. Open port insertion was used in 1200 cases (38.4%) with one complication, a small bowel perforation, to give an incidence of 0.08%. The Verres needle was used in alternative positions in 22 cases (0.75%) and, when used in the left upper quadrant (19 cases), there was one complication, a left hepatic lobe puncture, with an incidence of 5.26%. Our overall incidence of intra-abdominal injury was 0.13%, all in patients who had undergone previous abdominal surgery, and in the subgroup of patients with previous surgery the rate was 0.78%. There was no mortality.

**CONCLUSIONS** Practice varies as to the method chosen to induce pneumoperitoneum, but our results show there is no significant difference between the technique chosen and incidence of complications, and this is supported in the literature.

### KEYWORDS

Pneumoperitoneum – Laparoscopic surgery – Verres needle – Hasson technique

Accepted 19 October 2010; published online 4 November 2010

### CORRESPONDENCE TO

**Nikki Dunne**, Department of General Surgery, Royal Berkshire Hospital, London Road, Reading RG1 5AN, UK  
E: nikkidunne@hotmail.com

The first step in laparoscopic surgery is to establish a pneumoperitoneum; there are numerous different techniques available to the surgeon. This first step is the most dangerous, and most complications related to laparoscopic surgery as a generic technique occur at this stage, with a mortality rate of 0.05–0.2%.<sup>1</sup> The most feared complication on entry is injury to the major retroperitoneal vessels. Critics of the Verres needle ascribe an increased risk of vascular injury to this technique. Supporters of the open Hasson technique claim it could completely avoid vascular injury.<sup>2</sup> Hanney and colleagues,<sup>3</sup> however, cautioned against such statements since they had encountered two cases of aortic injury during use of the Hasson cannula, whilst still supporting the technique in preference to the Verres needle. Visceral perforation is the other major complication reported in both the open and closed techniques. It has a higher morbidity and mortality associated with it since many of the injuries go unrecognised at the time of the index surgery presenting

later with complications such as peritonitis and intra-abdominal abscesses.

All of the techniques are associated with both vascular and visceral injury, but extensive literature reviews have not proved the superiority of one technique to the others, largely due to the lack of large, randomised, controlled trial data.<sup>4–6</sup> Today, some 30 years on, the debate continues as to which method is the safest to use. Anecdotal evidence indicates that the younger generation of general surgeons prefer the open technique. In the era of evidence-based medicine, is the Verres needle technique being phased out without the evidence base to justify its loss?

This study comprises a prospective review of 3126 laparoscopic cases from two upper gastrointestinal (GI) surgeons, whereby one surgeon preferred the Verres needle technique and the other surgeon the open technique, to ascertain whether the complication rate is higher with the Verres needle and so justify its decreased usage in the modern era.

## Patients and Method

A prospective database was created; two upper GI surgeons (TD and MB) entered data for each laparoscopic operation performed over a 6-year period from 2002 to 2008. Complications were recorded as intra-operative or postoperative, and intra-operative complications were recorded as access-related or operation specific. The database was reviewed by a single author (ND) and access-related complication rates ascertained. Of 3126 patients, 1488 were females and 1638 were males with an age range of 14–88 years. One surgeon (TD) used the Verres needle technique preferentially, whereas the other surgeon (MB) used the open technique preferentially. Both surgeons used their non-preferred technique in some cases. A peri-umbilical approach was used routinely, with the left upper quadrant approach reserved for difficult cases, predominantly in those with previous upper abdominal incisions. A full range of upper GI operations and inguinal hernia repairs were included in the review.

## Results

Of 3126 cases, peri-umbilical Verres needle was used in 1887 cases (60.4%) and open port insertion in 1200 cases (38.4%). The Verres needle was inserted at the left upper quadrant in 19 cases (0.6%), the right upper quadrant in two cases (0.1%) and the right iliac fossa in one case (0.05%). A visiport was used in 17 cases (0.5%).

During the study period, there were 1857 cholecystectomies, 729 inguinal hernia repairs, 347 anti-reflux operations, 16 Heller's cardiomyotomies, 16 rolling hiatus hernia repairs, 31 diagnostic laparoscopies and 130 oesophagogastric cancer operations (including staging laparoscopies) all performed laparoscopically.

Overall, 510 patients (16.3%) had undergone previous abdominal surgery; 322 (63.1%) had pelvic incisions (Lanz,

herniorrhaphy and Pfannestiel), 110 (21.6%) had upper abdominal incisions (midline, paramedian and Kocher's) and 78 (15.3 %) had had previous laparoscopy.

Four complications were recorded whilst establishing pneumoperitoneum. Two occurred with the peri-umbilical Verres needle (0.1%); one serosal colonic tear and one full-thickness colonic perforation. With the open port insertion, there was one complication (0.08%) which was a small bowel perforation. With the left upper quadrant Verres needle insertion, there was a left hepatic lobe injury (5.26%) in a patient with undiagnosed hepatomegaly and a previous right paramedian incision. All four patients had undergone previous abdominal surgery, and the rate of intra-abdominal injury in the sub-group of patients with a previous history of abdominal surgery was 0.78%. The overall rate of intra-abdominal injury whilst establishing pneumoperitoneum, was 0.13% (Table 1). All four injuries were recognised at the time of the surgery and all were managed laparoscopically, with no mortality. There were no access related complications in patients with no previous history of abdominal surgery.

## Discussion

Laparoscopic surgery will only continue to expand in terms of the procedures which can be performed using the technique. With the first step, regardless of the procedure, being induction of pneumoperitoneum, all surgeons need to achieve competence in the technique. With the different options available, though, which one should you choose and why?

The two predominant techniques are the Verres needle and the open Hasson method with direct trocar insertion also having some support. In a literature review by Bonjer *et al.*,<sup>7</sup> 489,335 cases of closed laparoscopy (Verres needle) were reviewed; they found a visceral injury incidence of 0.083% with a mortality of 2.5% and a vascular injury inci-

Table 1 Injuries associated with the different entry techniques and their respective incidences

Method used	Total number	Number and type of injury	Incidence of injury
Peri-umbilical Verres	1887	1 colonic serosal tear 1 colonic perforation	0.1%
Open port insertion	1200	1 small bowel perforation	0.08%
Left upper quadrant Verres	19	1 left hepatic lobe puncture	5.26%
Visiport	17	0	0%
Right upper quadrant Verres	2	0	0%
Right iliac fossa Verres	1	0	0%
Overall	3126	4	0.13%

dence of 0.075% with a mortality of 0.8%. In the same study, 12,444 cases of open laparoscopy were reviewed; the incidence of visceral injury was 0.048% with no mortality, and there was no reported incidence of vascular injury. Most of the series reviewed were retrospective and thus there will have been a significant degree of under-reporting.

Our results show an overall rate of intra-abdominal complications on induction of pneumoperitoneum of 0.13% all occurring in patients with a previous history of abdominal surgery, with no vascular injuries encountered. Our incidence of visceral injury associated with the peri-umbilical Verres needle was 0.1%, which is marginally higher than that seen from Bonjer *et al.*,<sup>7</sup> although we have significantly fewer cases and our series is both prospective and accurately reported. In the series of Bonjer *et al.*,<sup>7</sup> two of their three visceral complications associated with closed laparoscopy occurred in patients with a previous history of abdominal surgery. The incidence of visceral injury associated with open port insertion was 0.08% which is again higher than that seen from Bonjer *et al.*<sup>7</sup> Deziel *et al.*<sup>8</sup> undertook a national survey of American hospitals and analysed 77,604 cases of laparoscopic cholecystectomies. They found vascular injuries in 0.25% of patients with major retroperitoneal vessels injured during trocar placement and other intra-abdominal vessels punctured by the Verres needle. Bowel injuries were discovered in 0.14% of patients with mechanism of injury including puncture from the Verres needle or trocar, thermal burns and retraction injury. This paper does not specify which technique was used to obtain pneumoperitoneum or how each of the vascular or visceral injuries occurred and whether they occurred in patients with a history of previous abdominal surgery. Ours is the first study, to our knowledge, to specify

the rate of intra-abdominal injury in patients with a previous history of abdominal surgery and this was 0.78% which we believe to be an acceptably low rate.

## Conclusions

Even within the same institution, practice varies as to the technique chosen to establish pneumoperitoneum as can be seen here. We conclude that there is no evidence to support the superiority of one technique over the other, and this view is supported by the literature. We believe that surgeons should be competent in both techniques. Either can be used without undue risk.

## References

1. Nuzzo G, Giuliani F, Tebala GD, Vellone M, Cavicchioni C. Routine use of open technique in laparoscopic operations. *J Am Coll Surg* 1997; **184**: 58–62.
2. Kazemier G, Hazebroek EJ, Lange JF, Bonjer HJ. Vascular injuries during laparoscopy. *J Am Coll Surg* 1998; **186**: 604–5.
3. Hanney RM, Carmalt HL, Merrett N, Tait N. Vascular injuries during laparoscopy associated with the Hasson technique. *J Am Coll Surg* 1999; **188**: 337–8.
4. Ballem RV, Rudomanski J. Techniques of pneumoperitoneum. *Surg Laparosc Endosc* 1993; **3**: 42–3.
5. Hurd WW, Randolph Jr JF, Holmberg RA, Pearl ML, Hubbell GP. Open laparoscopy without special instruments or sutures. Comparison with a closed technique. *J Reprod Med* 1994; **39**: 393–7.
6. Catarci M, Carlini M, Gentileschi P, Santoro E. Major and minor injuries during the creation of pneumoperitoneum: A multicenter study on 12,919 cases. *Surg Endosc* 2001; **15**: 566–9.
7. Bonjer HJ, Hazebroek EJ, Kazemier MC, Giuffrida MC, Meijer WS, Lange JF. Open versus closed establishment of pneumoperitoneum in laparoscopic surgery. *Br J Surg* 1997; **84**: 599–602.
8. Deziel DJ, Millikan KW, Economou SG, Doolas A, Ko ST, Airan MC. Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. *Am J Surg* 1993; **165**: 9–14.